THE NEED OF THE CITY OF NEW YORK

—FOR—

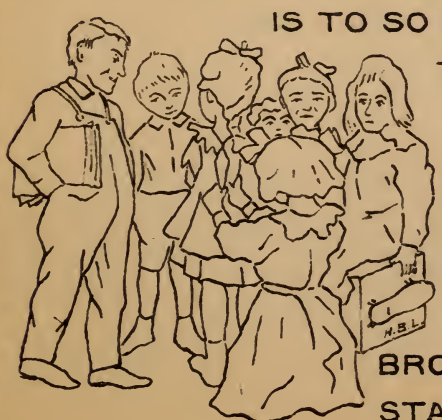
MORE WATER

AND WHERE IT CAN BEST BE OBTAINED.

FOREWORD

WATER IS NECESSARY FOR THE ADVANCEMENT OF CIVILIZATION AS WELL AS FOR THE GROWTH OF CITIES. AS CIVILIZATION BECOMES MORE COMPLEX IT DEMANDS A MORE LIBERAL USE OF WATER ON THE PART OF EACH INDIVIDUAL. AS A CITY GROWS IT REQUIRES MORE WATER JUST AS RAPIDLY AS ITS POPULATION AND INDUSTRIES INCREASE.

THE PRINCIPLES WHICH GOVERN THE DETERMINATION OF HOW MUCH WATER A GIVEN SUPPLY WILL YIELD, OF HOW MUCH WATER IS REQUIRED BY A CITY AND WHERE MORE WATER IF NEEDED CAN BE OBTAINED, ARE ALL SUSCEPTIBLE OF BEING SIMPLY AND CLEARLY EXPRESSED. THE PURPOSE OF THIS PAMPHLET IS TO SO STATE THESE MATTERS THAT THE LAYMAN, WHO IS NOT FAMILIAR WITH ENGINEERING TERMS, WILL HAVE NO TROUBLE IN READING IT AND WILL AT THE SAME TIME BE BROUGHT TO A BETTER UNDERSTANDING OF THE SUBJECT.



What Water Is Used For

Water is used for drinking, washing and bathing. It is used for sprinkling our streets and lawns and for putting out fires. It is used in factories, in breweries and in boilers for driving locomotives, elevators and the dynamos which furnish our light as well as the power for operating our subways, our elevated and our surface cars. It is used for cooking, for making concrete and in automobiles. It is used as a vehicle for carrying away our wastes

and sewage. It is used every day of every year by every man, woman and child. It is used in every home, factory, mill and shop for the thousand and one purposes for which nature has made it serviceable and necessary, and for which civilization and the health of the community demand that it be used and used liberally.

Where Water Comes From

Water comes from the clouds in the form of rain. This is the source of all fresh water whether it be found flowing in a stream or at the bottom of a well. The rain after falling onto the ground runs down to the nearest stream, then into the larger stream and, finally, is lost in the ocean.

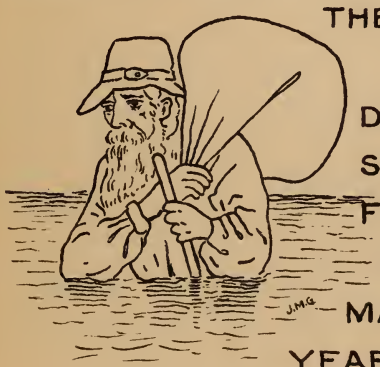
Not all of the rain which falls gets

into the nearest stream. Some of it, which soaks into the ground, does finally get there after reappearing in springs, but more of it is used up by the grass and the trees, and much of it

simply dries up or evaporates. ONLY ONE HALF of all the rain that falls gets into the streams and can be made useful for the purposes of man.

How Much Rain Falls

If all of the rain which falls should remain on the ground and not run into the streams, in an average year it would, in the vicinity of New York, accumulate to a depth of 48 inches. In a very dry year it would only be 37 inches deep while in a wet one 63 inches would pile up. This variation is shown in the sketches on this page.



Now, sometimes two dry years come together; sometimes three, four or five years may be consecutively dry, and there may occur as many as 18 years in succession during which the rainfall will be less than the average. So also there may occur as many as 18 consecutive years during which the rainfall will be greater than the average.

Reservoirs are built for the purpose of equalizing this lack of uniformity by storing the water of wet times to help out during those which are dry.

How Much Water Flows in a Stream

The amount of water which flows in a stream depends on the rainfall. In wet years there is much. In dry years there is little.

In summer when the temperature is high and when the trees and grass are growing vigorously, much less of the rainfall gets into the streams than in winter when it is cold and vegetation is not growing. Taking the year as a whole one half of all the rainfall flows down a stream and the quantity which flows is dependent on the size of the area which the stream drains.

A stream which drains one square mile of country may have a flow, during freshets, as high as 45,000 gallons per minute; during dry times its flow may be as little as 30 gallons per minute, while its average flow for an average year will be 800 gallons per minute.

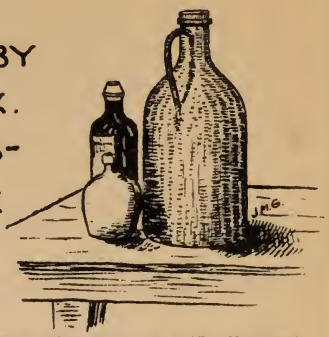
How Water Can Be Gotten

Water for a municipal supply may be obtained by building a dam across a stream, so forming a reservoir and from this reservoir then leading a pipe to the city or town. It may also be obtained by digging wells and pumping from them. This however can only be done in sandy soil.

A reservoir is necessary for the purpose of equalizing the flow of the stream by storing the water which comes down during wet times to tide over those times which are dry. There are very few streams large enough to at all times furnish as much water as a city of the size of New York needs each and every day of the year. A stream large enough for such service would be over 20 times as large as the Croton River.

When water is pumped from wells, the sandy body of earth which holds the water acts as the equalizer or reservoir, but no more water can be obtained from wells than from a stream which has been dammed. This is true because if the areas of country drained by the stream and the wells are the same, then the total amount of rain falling is the same, and, since all fresh water comes from the clouds in the form of rain, the stream and the wells will yield alike.

How Water Is Measured

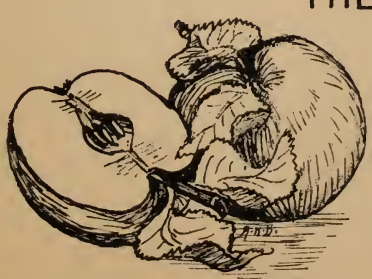


Water can be measured by catching it in a pail or a box. It can be measured in a reservoir when the size of the reservoir is known or by allowing it to flow over a dam and measuring its depth on that dam. The unit of measurement is the gallon. Two pints make one quart, four quarts make one gallon. In water supply engineering the unit is one million of gallons.

Rainfall is measured by catching it in a vessel and measuring its depth in that vessel.

When the area of country which drains into a stream is known and the rainfall on it has been measured, the whole quantity of water which fell in the form of rain becomes known.

Measurements of the water which flows in a stream, when compared with the quantity of water which falls as rain, prove that only one half of all the rain which falls finds its way into the streams. The other half goes to supply the needs of vegetation and is carried off into the atmosphere by evaporation.



How Rapidly New York Grows

Since 1900 the greater city has been growing at the rate of 125,000 persons per year. In other words this rate of increase in population means that each decade sees an increase of 1,250,000.

Should this rate be maintained the population of the city for the next 20 years, stated by five year periods, will be as follows:-

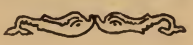
1910	4,625,000
1915	5,250,000
1920	5,875,000
1925	6,500,000
1930	7,125,000

The present population of Jersey City, with which all New Yorkers are more or less familiar, is about 250,000. At New York's present rate of growth therefore, each two years sees it as much larger as all of Jersey City is today.

How long this rate of increase will, or can be maintained no one knows. All of the larger American cities are rapidly increasing in size and at approximately the same rate.

As long as there is an incentive for growth, and sufficient room in which that growth can occur, a city must continue to increase. Of room New York has a plenty, while of incentive, it is difficult to conceive that the future will hold less of it than has the past.

How Much Water New York Uses



The entire consumption of water in the greater city was, in 1898, 368 millions of gallons each day and in 1905 it had reached a total of 480 millions of gallons daily.

The use of water during 1908 will be divided among the various boroughs approximately as follows;

MANHATTAN BRONX	} 358	millions of gallons daily
BROOKLYN	145	" " " "
QUEENS	30	" " " "
RICHMOND	10	" " " "
Total	543	millions of gallons daily

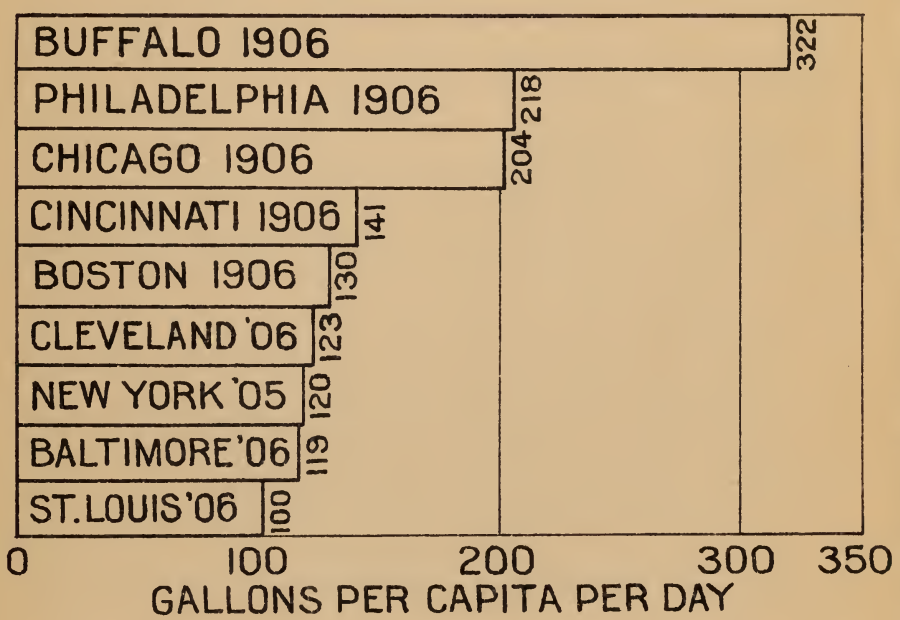
The per capita use of water for the greater city in 1898 was 115 gallons per day and in 1905 each person used 120 gallons each day.

In arriving at these figures for the per capita consumption, no account is taken either of the transient population or of the large number of commuters who each day come into the city from Connecticut, from New Jersey and from New York outside the city limits. The total consumption for the city therefore has been increasing at the rate of about 18 millions of gallons daily each year and it is seen also that this rate has been steadily maintained for the past ten years.

How Much Water Other Cities Use

The use of water in an American city must be judged by American standards.

In the following diagram are shown graphically the amounts of water used per capita in the nine largest cities of the United States.



It is seen therefore, that in its use of water, New York is not extravagant, but on the contrary, that it is one of the most economical among those cities by which it can most fairly be judged.

These figures cover all water delivered to the various cities, and include therefore that used for every purpose as well as that which is lost from leaky pipes, that which is stolen and that which is wasted, whether wilfully or through ignorance.

How Much Water Is Wasted

Water waste is of two kinds, that which is preventable and that which will occur under the best of conditions and management.

Preventable waste includes wilful waste such as that due to "letting the water run" whether "to keep the pipes from freezing" or in order "to get a cool drink". It includes also excessive leakage which could readily be prevented in aqueducts, in street mains and in plumbing everywhere.

Waste which cannot easily be prevented includes necessary waste which results from the use of water for sanitary purposes, and also that due to the thousand and one small leaks in aqueducts, mains and plumbing which cannot be discovered and repaired by any possible means.

If meters were put on every pipe in the city it is improbable that the saving effected could exceed 15% of the present consumption.

Universal metering, even if it were possible, could not make more water available. It could only make the present supplies last longer, and finally more water would be necessary just the same.

Capacity of Present Croton System

Croton water was used by Manhattan and the Bronx during 1907 at the rate of 324 millions of gallons daily. The consumption of this water is increasing at the rate of 15 millions of gallons daily each year. Therefore, in 1911 the average daily use of this water will be 384 millions of gallons daily.

The capacity of the present aqueducts from the Croton valley, taken both together, is 380 millions of gallons daily.

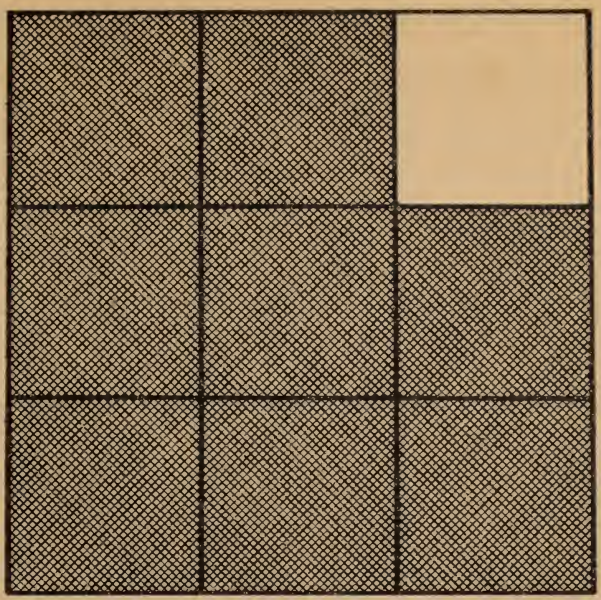
The safe yield of the Croton as it will be when the Croton Falls reservoir is completed is 336 millions of gallons daily.

It appears, therefore, that the present use of water from this source is practically up to the limit of its capacity and that within four years, if no dry time intervenes, and no matter how wet the seasons may then be, that the aqueducts will be taxed to their utmost in order to supply the demand.

When this condition arises the time will have come when the use of water must be curtailed by denying it to the people who will need it and, needing, demand it.

This time is but four years hence and unless Providence sends, during the intervening years, a plenty of rain, it will be in our midst even sooner.

More Water from the Croton River?

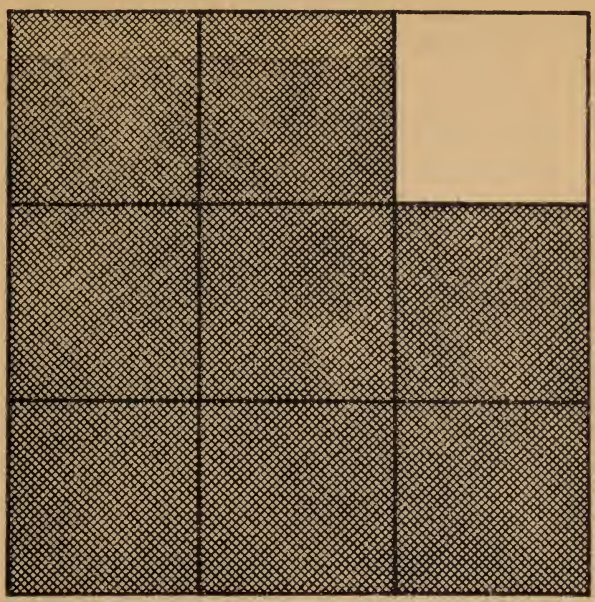


Each of these small squares represents one-ninth of all the water which flows in the Croton River. These nine squares therefore, represent, in the one large square all of the water which can possibly be gotten from that river. The records of the past 40 years show conclusively that there is no more than this.

The eight shaded squares represent that portion of all the water which New York can take from the Croton River through its present pipes when the reservoirs now under construction are completed.

To get this eight-ninths of all the water the Croton can furnish has cost a capital expenditure of $87,400,000.

More Water from the Croton River?



The one square which is unshaded represents the water which now goes to waste over the Croton dam. To make this water available for the use of the city would require a further capital expenditure of $145,000,000.

It seems curious that to get this seemingly small quantity of water should necessitate such a large expenditure, but when it is remembered that the records show that for 18 consecutive years the flow of the river may be far below the average, it is easily seen that to tide over such a dry period would require enormous reservoirs. Such reservoirs are expensive in a populous country where land values are high.

Other Possible Sources of Supply

1. The Esopus, Schoharie, Rondout and Catskill Creeks in the Catskill Mountains where 500 million gallons daily can be obtained at a cost of $161,000,000.

2. The Housatonic, Delaware and Susquehanna Rivers are physically possible as sources of supply but they are interstate waters and therefore cannot be utilized.

3. The Croton River by legislative enactment cannot be further developed, and for this same reason the other streams of Westchester County, as well as all those of Dutchess County, stand unavailable. The same objection too, now prevents going for water to the sands of Suffolk County on Long Island.

4. The Great Lakes, the Hudson River and the Adirondack region offer available supplies. But the great distance to the Adirondacks renders the cost of getting it excessive. Water from the Hudson River would have to be pumped and so its cost would be greater than that of a supply flowing naturally to the city, even if it were necessary to go 200 miles in order to obtain it.

5. Aside from a few small streams west of the Hudson which are hardly worth developing as a permanent supply, there are no others.

Does New York Need More Water?

The consumption of water in the greater city during 1905 was 480 millions of gallons each day. The city is growing at the yearly rate of 125,000. The use of water has been keeping pace with this increase at the rate of 18 million gallons daily.

The safe yield of all the present sources of supply is not in excess of 500 million gallons daily. Brooklyn has already been in an unpleasant situation a number of times in years not extremely dry.

In 1912 the demand for Croton water will exceed the capacity of the present aqueducts, and in the event of a dry period before then, the borough of Manhattan will surely experience a water famine.

Richmond has practically exhausted her resources and has failed in her efforts to obtain relief from New Jersey.

Queens is largely dependent on private water companies; her demand is increasing rapidly and the supply is not overabundant.

The needs of the future must be provided for in the present since otherwise growth must cease. Every fact, figure and argument which can be advanced shows that New York does need more water and that she needs it badly.

A Plain Question

THE CROTON RIVER WHEN DEVELOPED AS NOW CONTEMPLATED WILL YIELD FOR THE USE OF THE CITY 336 MILLIONS OF GALLONS DAILY. THIS CAN BE REPRESENTED BY SEVEN BARRELS WHICH COST $87,400,000.

TO TAKE EVERY DROP OF WATER FROM THE CROTON WILL YIELD ONLY 46 MILLIONS OF GALLONS MORE EACH DAY. THIS CAN BE REPRESENTED BY ONE BARREL COSTING $145,000,000.

FROM THE CATSKILLS 250 MILLIONS OF GALLONS DAILY CAN BE BROUGHT TO THE CITY LIMITS AT A COST OF $102,000,000. THIS CAN BE SHOWN BY FIVE BARRELS.

THIS 250 MILLIONS OF GALLONS DAILY AND 250 MILLIONS MORE, CAN EACH DAY BE FILTERED AND DELIVERED INTO THE BOROUGHS OF THE GREATER CITY FOR AN ADDITIONAL EXPENDITURE OF $59,000,000. THIS CAN ALSO BE REPRESENTED BY FIVE BARRELS.

-:THE QUESTION:-

WHICH DO YOU THINK IS THE CHEAPER, 10 BARRELS OF WATER COSTING $ 161,000,000 OR 1 BARREL COSTING $145,000,000 ?

LITHO. BY CHAS. HART 36 VESEY ST. N.Y.


WHATSOEVER
A MAN
SOWETH THAT
SHALL
HE ALSO REAP
GAL. 6. 7
H.B.L.